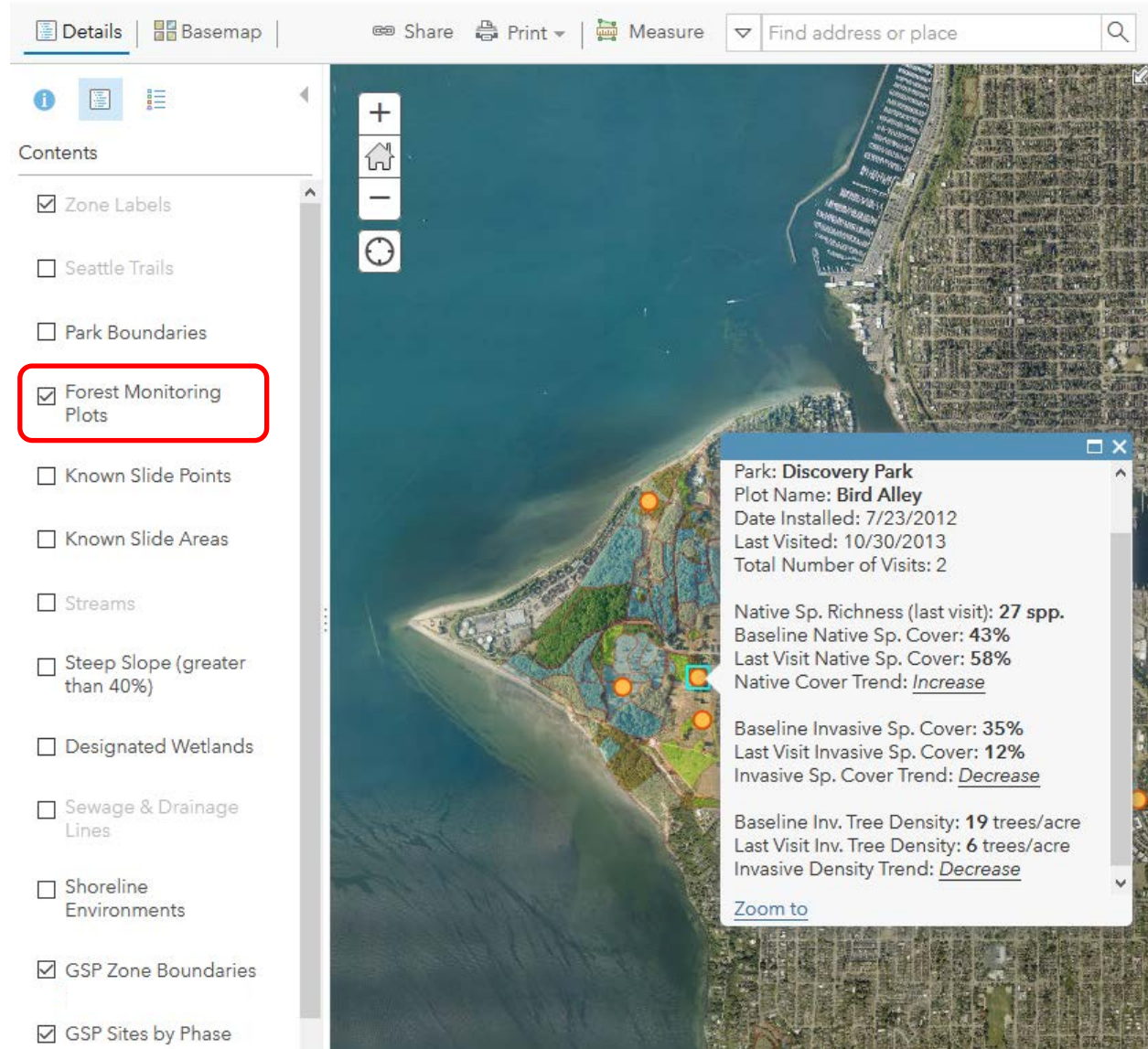# GSP Forest Monitoring Program

Welcome to the GSP Forest Monitoring Plot Reference Guide. This document provides information regarding the long-term monitoring program and how to find data highlighting the structure and composition of Seattle Parks forested natural areas. The plot locations can be added to the map by clicking "Content" and then checking the box next to "Forest Monitoring Plots" in the Table of Contents (see image below). Click on a plot in the map to see details about the plot and a summary of the data including changes in native and invasive species cover and invasive tree density.

Last Updated: 12/31/19

Frequently Asked Questions

The following list of questions is intended to answer some of the basic questions regarding the Forest Monitoring Program. For more information regarding the GSP Reference Map in general, please visit https://www.greenseattle.org/information-for/forest-steward-resources/gsp-restoration-map/ for details.

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Reference Guide FAQ

1. *What is the Forest Monitoring Program?*
   The Forest Monitoring Program, a project of the Green Seattle Partnership (GSP), is a collaborative effort between Seattle Parks and Recreation (SPR), EarthCorps, volunteers and other GSP partner organizations. The Program was designed to provide an empirical analysis of change over time at GSP restoration sites. This is accomplished by collecting repeatable data at permanent plots during different phases of restoration and over time. Plots were established across the city and distributed proportionally based on the Target System determined for each GSP Management Zone. See the Green Seattle Partnership [Reference Ecosystems](#) web page for more information. These data compliment other GSP tracking and monitoring data including stewardship tracking ([CEDAR](#)) and the annual [inventory of restoration sites](#).

2. *Why is collecting these data important?*
   In order to understand the success, value, and effectiveness of our restoration activities, the Green Seattle Partnership has implemented a set of Standardized Monitoring protocols. Monitoring protocols are collection procedures that can be replicated over time to measure change in site characteristics. The recorded information can be used to show the composition and structure of a site, which can be an important indicator of overall forest health.

   Standardized monitoring protocols and the resulting data are valuable because they:
   - Provide a quantitative and objective way to evaluate restoration progress
   - Allow for comparisons and generalizations across sites, parks, and municipalities over time.
   - Improve our understanding of the effectiveness of restoration techniques, providing information to adapt management techniques when necessary.

3. *Where do these data come from?*
   The plots were installed and baseline data collected primarily between 2010 and 2013. Plots were installed by a combination of trained volunteers, trained restoration contractors, and paid ecologists. Volunteer data collection continued through 2015 when the Program shifted to using trained professional contractors to revisit and monitor plots. The plots were preferably established in areas before active management occurred and then revisited to capture changes following restoration efforts. Now that majorities of our parks are under active management, data will be collected at each plot on an approximate 5 year rotation in order to show long-term changes over time.

4. *What kind of data is collected?*
   Data collected at each plot includes:
   - Size and quantity of trees and seedlings
   - Extent of invasive plant cover
   - Cover of shrubs, vines, and ground cover
   - Size and quantity of dead snags and coarse woody debris
   - Site characteristics, including soil type, aspect, and slope

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5. *How often is data collected at each plot?*

   Many of the baseline plots were initially monitored one and/or two years following baseline installation. Plots are now scheduled to be monitored on a 5 year rotation to continue to track changes to the structure and composition of our forests over time.

6. *How are these data being used?*

   While we now have almost ten years of monitoring data (as of 2019), we are still in the early stages of the Program! Of the intended 150 permanent monitoring plots, only about 85% have been revisited at least once. The remaining baseline plots are considered a high priority to revisit in the next few monitoring seasons. Already, the data from these plots are helping us better understand how management techniques are changing the landscape. One example is tracking the change in invasive species cover over time.

   As more and more of our forested parklands are brought into restoration, we have seen a marked decrease in the average cover of invasive plant species. See the figures below to see how average invasive species cover (Figure 1) and the most common invasive species (Figure 2) have changed across Seattle since monitoring began in 2010.

Figure 1. Comparison of overall average species cover for plots monitored twice (N=46). Bars represent plus and minus Standard Error.
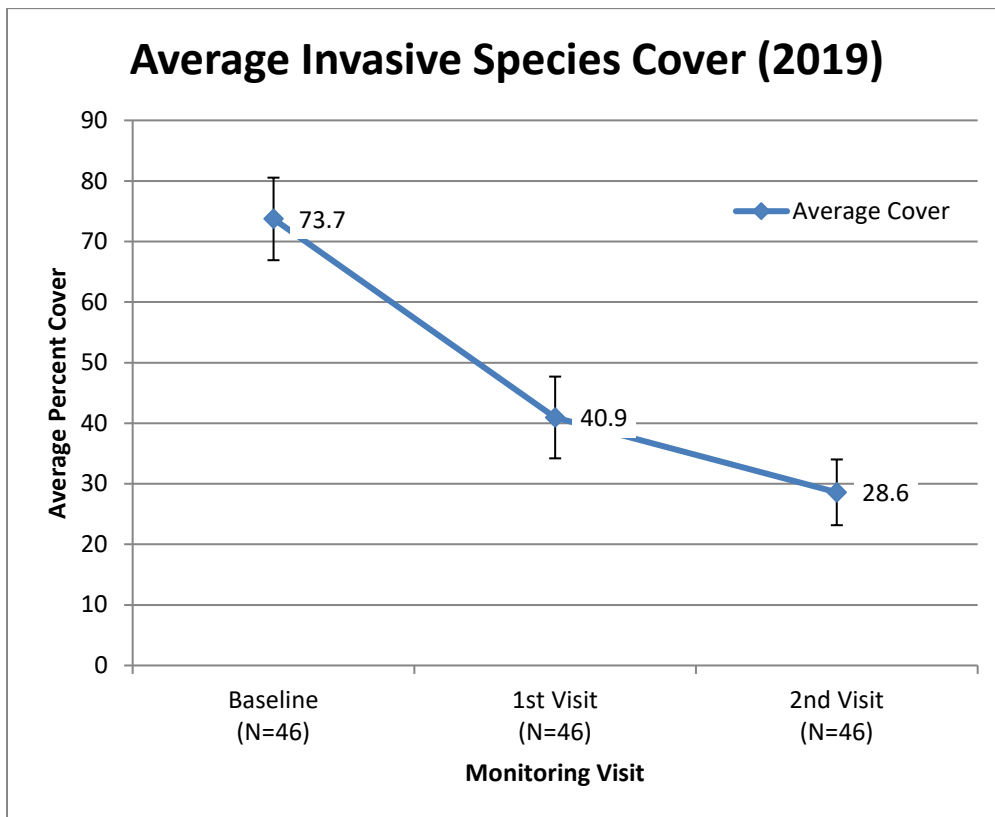
Figure 2. Dominant invasive species (by average cover where present) showing changes from Baseline and Most Recent visits (N=140). Bars represent plus and minus Standard Error
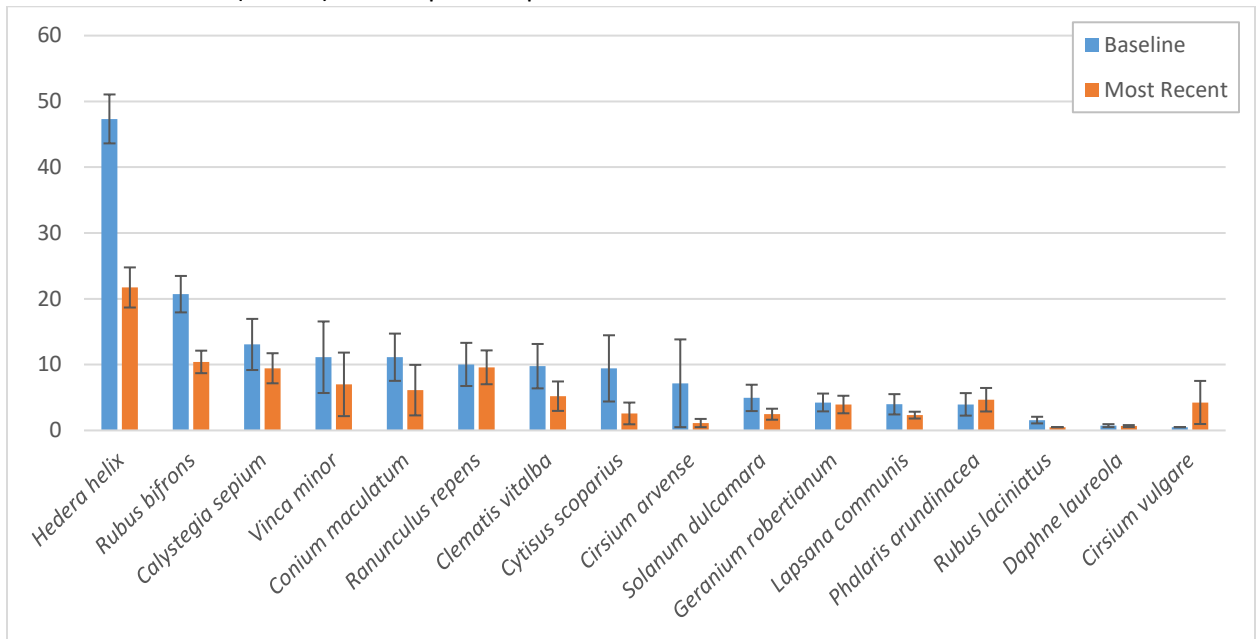
7. ***What is next?***

As more and more plots are revisited, our data set comparing changes to the forest continue to be refined. It is important to remember that changes to the structure and composition of forests take time: think of how long it takes for a planted tree to reach the canopy. As more data is collected, we will have more opportunities to analyze and interpret these data.

Potential analysis could include analyzing the current forest structure and composition and measuring how these factors are changing as a result of ongoing management and restoration efforts. Other studies could use this data to model stormwater mitigation effects, carbon sequestration, and air purification and how restoration efforts could enhance these ecosystem services. Applications using i-Tree software could be used to compare plot level data from different types of forests in order to extrapolate ecosystem services from our existing forests. This information could then be modeled to estimate how restoration of existing forests could lead to increases and changes in these invaluable ecosystem services. Let us know if you have ideas on how these data can be utilized!

As our restoration techniques continue to be refined and improved upon, our forested natural areas are continuing to change and develop. Active restoration sites are becoming more and more established and resilient with the help of thousands of hours of community care and stewardship. This program will continue to be instrumental in documenting these changes and improve our understanding of management techniques.

8. ***How can I get more information?***

For more information regarding the Forest Monitoring Program, please contact info@earthcorps.org